Revision of the Atlas of New South Wales Wildlife

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ABSTRACT

A revised computer-based wildlife inventory programme has been developed to aid the collation and mapping of fauna and flora information. Field data books have been produced to facilitate the collection of significant records in a format that is easy to handle. Current maps for the records for the terrestrial vertebrate classes are presented.

INTRODUCTION

Wildlife management organizations are required to provide information about the natural resources under their jurisdiction to their own staff, to other government bodies and to the public. For plant species this is often achieved by the production of vegetation maps based on aerial photography, and more recently by the use of remote sensing (satellite imagery). Even so, details about the individual species is often lost in the generalities of the map. For fauna, the situation is even worse since no remote methods for mapping are available, and knowledge about their abundance and distribution is based on observations made either incidentally or systematically. Storage and retrieval of such information has been difficult until the advent of modern computers, often relying on the accumulated knowledge of experienced observers.

In 1981 Bruce Gall, with the NSW National Parks and Wildlife Service (NPWS), started an "Inventory of New South Wales Wildlife" which soon became known as Wildata (Gall and Christian 1984). It was a computerised system to record sightings of vertebrate fauna, mainly from Service staff. The basis of collecting the records was that sufficient occurrence records would eventually elucidate the distribution (and changes to it) of the various species. It was also envisaged that it would allow rapid retrieval of information that had already been collected.

The initial system was written in FORTRAN and was placed on the CSIRO Division of Plant Industry computer. A handbook was produced and data recording cards were issued (Fig. 1). Separate data cards were produced for mammals, passerines, non-passerines, turtles and snakes, lizards, and frogs.

After Bruce Gall left the Service the system came under control of Liz Dovey. Since there were no staff positions allocated to running the system, all data entry was conducted on a volunteer basis. There were few alterations to the original computer programmes so that as the computer system was updated (e.g., new plotting machinery, changed processors) the programmes gradually became obsolete. By this stage the system had accumulated approximately 52 000 entries, although a number of these were duplicates.

In mid 1990 an opportunity arose to write a prototype of a revised database in Advanced Revelation. The Department of Conservation and Environment in Victoria had written a faunal database so the chance was taken to make the systems compatible across the border. The content of the database was considerably expanded from the original system. At this stage the system was renamed the Atlas of New South Wales Wildlife because the name "Wildata" had been registered as a business name by a private company.

The use of the Advanced Revelation database management system has allowed the Atlas to be moved off a mainframe computer onto a desktop computer and still maintain reasonable search speeds for the number of records held. The database management system also allows the indexing of frequently searched fields to improve the search speeds, while not restricting which fields can be searched. The system is intended to act as a tool for both land management and species management at either the localized or state-wide level. The data can be combined with records from other states to study problems across political boundaries.

METHODS

Field Data Books

The Department of Conservation and Environment in Victoria had already produced a plastic covered field data book. This was more robust than the original handbook for

Figure 1. The original data book and cards.

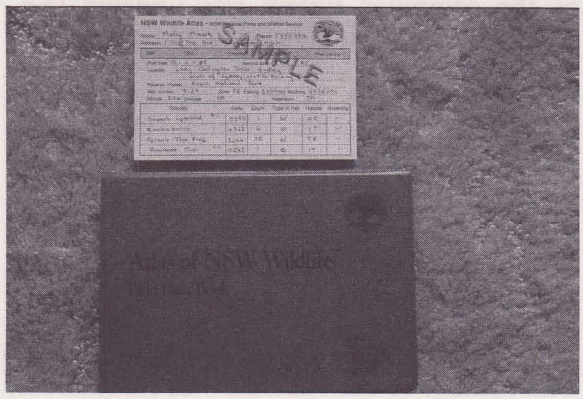

Figure 2. The current handbook and card.

the New South Wales system (Gall 1981) and it was easy to update individual pages within the book. This is important with the constant changes to the taxonomy and common names of the Australian fauna. The data layout was also more structured and used coding systems for a number of the attributes recorded. The Victorian system was an advance over the original New South Wales system so the codes and structures used for the New South Wales system were based on those used in Victoria and new data-books were printed (Fig. 2). The new data cards (Fig. 3) allowed any species to be recorded on the same card, rather than having separate cards for each of the six groups of terrestrial vertebrates recognized in the old system. The revised instructions for completing a record card are reproduced in Figure 4.

The major changes to the system were the adoption of the species lists and codes generated by the Australian National Parks and Wildlife Service and the use of full Australian Map Grid references. The latter change will hopefully reduce the incidence of people mixing up eastings and northings which results in locations being plotted incorrectly on maps by up to 140 km. The example from the handbook is reproduced in Figure 5.

Computer Records

The records held in the old system were converted to the new codes and many of the duplicated records were removed. Other

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Name: _____ Phone: _____

Address: _____

Ref	Obs:	Entered	Checked	Office use only

First date: __/___/____ Second date: __/___/____

Location: _____

_____

Reserve / Forest: _____

Map number: _____ Zone __ Easting _____ Northing _____

Altitude ____ Geology _____ Vegetation _____

Species	Code	Count	Type of Rec.	Habitat	Breeding

Figure 3. The front of the new fauna record card.

Field Data Sheet Instructions

Each sheet or card refers to a specific locality and time period. Mammals, birds, reptiles and amphibians can be entered on a single sheet or card. The card is a convenient method for recording incidental reports. Use the sheet for lists of more than ten species. The field sheet and card are completed in the same way.

A sample field data card is attached. The Service office entering the records will assign the reference number, project and observer codes.

Dates: Record the period of observation covered by the sheet. If recording on a single day use first date only (e.g. 02 Jun 1978) otherwise use a starting and finishing date. Preferably, the period of observation should fall cleanly into calendar months, but can cover months or years for records with poorly known dates (e.g. 01 Jan 1870 to 31 Dec 1879 for records from the 1870's).

Locality: Describe the locality as precisely as possible using place names on NATMAP or LIC (CMA) series maps. Preferably give a distance and direction from a named point.

Reserve/Forest: Enter the name of the forest or reserve that the record is from.

Grid references: Specify the sheet number (e.g. 8124). Enter the zone, easting and northing of the locality to the known accuracy. For example, if accuracy is to the nearest 1km enter dashes (not zeros) in the appropriate spaces (e.g. 56 345--- 6123---).

AMG Golden Rule: Eastings (numbers across top & bottom of map) first and then Northings (numbers up sides of map).

Altitude: In metres, read from a topographic map.

Geology: Record the geology from the immediate area of the observation if possible. A chart of geological types is provided.

Vegetation: Record the structure of the vegetation. A chart based on the Australian Land Survey Handbook is provided. The growth form of the plants is listed down the edge, and their spacing across the top. The entry in the table gives standard names for each combination, and this name should be used. The dominant plant species can be recorded in the notes section.

Species Entries: For general observations list in any order the mammals, birds, reptiles and amphibians that you observed.

Species and Code: Enter species name and code from lists supplied. An abbreviated species name is acceptable. If you do not find the name of the animal on the provided lists then use the name that you know it by and the code will be found later.

Count: Enter the actual number of individuals counted. If the count was an estimate follow it with an E, e.g. 8E.

Type of record

O	Observed	B	Burnt
F	Tracks, scratchings	T	Trapped or netted
H	Hair or feathers	Y	Bone or teeth
R	Road kill	P	Scat
D	Dog kill	W	Heard call
C	Cat kill	Z	In raptor/owl pellet
V	Fox kill	E	Nest/roost
K	Dead	M	Miscellaneous
S	Shot	N	Not located
X	In scat		

Microhabitat code

AC	Flying above canopy	FL	Flying within canopy
UC	Upper canopy	MC	Mid canopy
LC	Lower canopy	TK	On trunk
IT	In tree	DT	In dead tree (stag)
IH	In tree hollow	HS	High shrub
LS	Low shrub	UG	Undergrowth
IG	In grass	IR	In reeds
GR	On ground	OL	On log
UL	Under log	OR	On rock
UR	Under rock	UB	Under bark
UT	Under iron	IS	In soil
IB	In burrow	RD	On road
BR	In/on bridge	FC	In/on post or stump
IW	In water	EW	Edge of water
OW	Over water	DA	Farm/fire dam
WH	Waterhole	IL	In litter
BU	In building	IC	In cave

Breeding

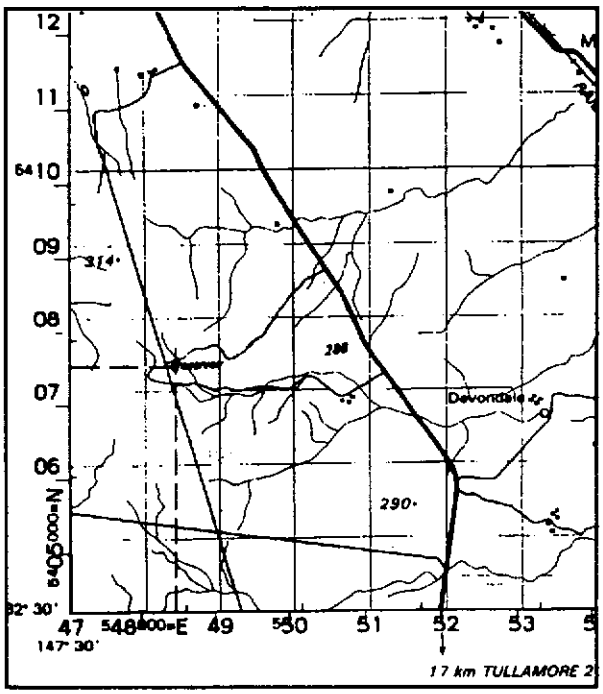
E	Eggs	J	Juveniles
L	Lactating	N	Nesting
P	Pregnant	Y	Yes, but no details
-	Not breeding		

Notes: Use this section for comments on vegetation, identification of difficult species and noteworthy observations.

Specimens: We encourage persons holding an appropriate wildlife permit to submit remains of dead animals, or voucher specimens of difficult species, as confirmation of the identification. Specimens should be frozen or soaked in 10% formalin, and sent to the Australian Museum, 6-8 College St, SYDNEY 2000. Specimens soaked in formalin may be sent through the normal post provided strong waterproof packaging is used, while frozen material will need to be transported quickly and with insulation to prevent thawing.

Figure 4. Instruction sheets for completing a record card.

How to Give A Grid Reference



The Australian Continent is divided into zones which are 6° of longitude wide. Each zone is covered by a grid with the coordinates given in metres. X coordinates are now called **Eastings** (a 6 digit number for how far east) and Y coordinates are called **Northings** (a 7 digit number for how far north). This system is called the Australian Map Grid or **AMG**.

New South Wales is spanned by 3 zones, **Zone 54** (138°-144°), **Zone 55** (144°-150°) and **Zone 56** (150°-156°). For any given point, the grid reference is given by the zone number, followed by the easting and lastly the northing.

For example, the grid reference for the reservoir on the adjacent map will be:

55 548300 6407300

Figure 5. The instruction card on how to give a full grid reference in New South Wales.

coding errors (mainly due to the duplication of species codes across the various groups in the old system) were removed resulting in about 30 000 records being salvaged. The exact number is not know since new records were already being entered into the prototype by the time the old records were converted.

The prototype was placed in Lismore District Office for trial in November 1990. During the following six months a series of adjustments were made to the system, databooks were printed, and distribution of the books among Service staff commenced. Some databooks have also been distributed to interested naturalists. During the 1991/92 financial year a temporary position was funded for six months to enable data entry to proceed. At the current time (August 1992) the system contains over 110 000 fauna records and 75 000 flora records. The Victorian scheme has accumulated over one million fauna records (P. Menkhorst, pers. comm.).

Locality records are being extracted from NPWS files, staff notebooks and survey reports. Records are also being solicited from people known to have worked in areas currently being surveyed (the north coast and the south east forests).

Data collation and entry is currently being carried out in six main localities (NPWS Head Office, Northern Region Office, Lismore District Office, Armidale GIS Office, Griffith District Office, South East Forests Office and South Eastern Region Office) with 13 other NPWS offices entering incidental records. It is envisaged that these offices will be put on a computer network during 1992/93 so that all data entry and revision will be carried out on one master set of files.

The breakdown of the records by class is given in Table 1 and their distribution is shown in Figure 6. There are still records in the system that are incorrectly located, for example there are oceanic records of possums and gliders as the result of reversed grid references.

Table 1. Number of fauna records by class as of August 1992.

Class	Records held
Amphibia (Frogs)	1 606
Reptilia (Reptiles)	5 765
Aves (Birds)	87 710
Mammalia (Mammals)	18 900
	113 981

APPLICATIONS

The data held have a number of applications for the Service. The simplest is the provision of species lists for the various National Parks and Nature Reserves controlled by the Service. These are usually requested by park visitors, but are sometimes used by researchers.

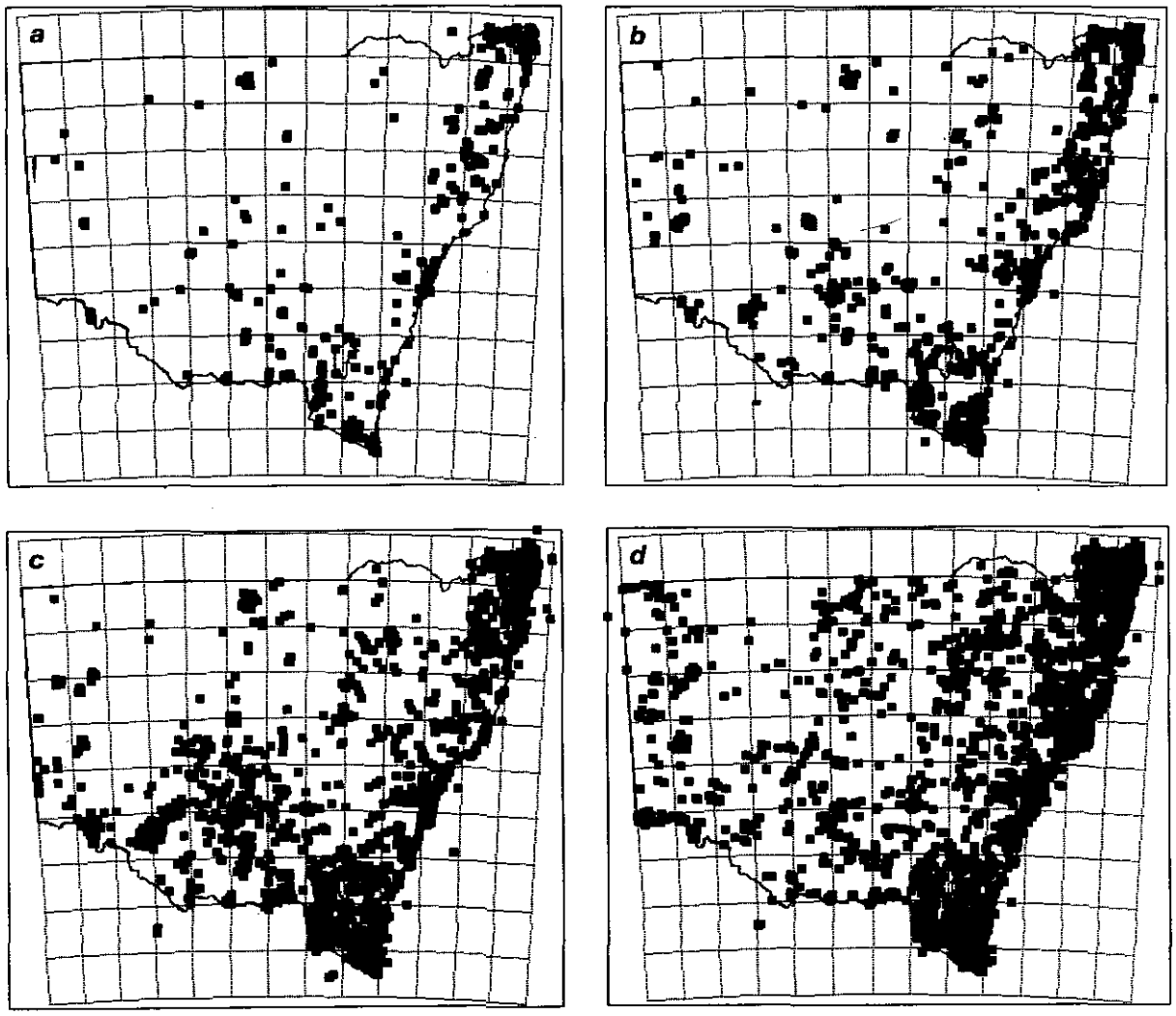


Figure 6. The distribution of all the (a) amphibian, (b) reptile, (c) bird, and (d) mammal records in the database.

Individual studies can be supported by the system. For example, a study of the mammalian fauna of conservation concern in western New South Wales (Dickman *et al.* in press) collected records from a variety of sources. These data could then be manipulated to assess the changes in fauna distributions, which can be graphically displayed by the production of maps (Fig. 7). These data are then available for subsequent studies of the area. Similarly, studies of the forests of northeastern and southeastern New South Wales, and of Koalas *Phascolarctos cinereus* are being supported by the database.

Recent changes to legislation in New South Wales have placed an increasing demand on the database. Since the number of records is relatively low compared to the area of New South Wales, assessment of activities under the Endangered Fauna (Interim Protection) Act 1991 is difficult if only the actual records are used. To overcome this limitation, the database has a facility to calculate predicted distributions

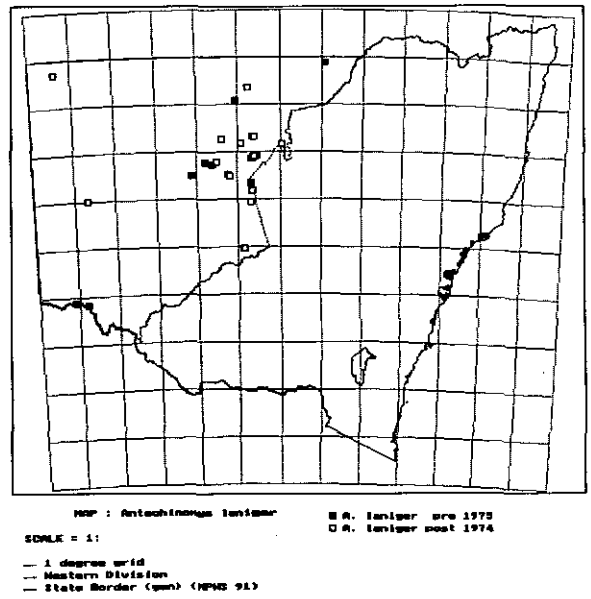


Figure 7. An example of the maps generated for the study of western New South Wales mammalian fauna. This map shows the distribution of *Antechinomys laniger* records for two time periods.

for each species. This is based on the climate analysis methods described by Busby (1991), but uses a 30-minute grid. This grid should soon be reduced to a 6-minute interval.

DISCUSSION

The value of the atlas will depend on the quality and extent of the data held within it. A wide spread of records across time and space is needed if we are to understand the needs of, and threats to, various species. The higher the accuracy of the geographic location of the record the more use it will be in modelling species distributions at the local level. However, for rare and poorly known species even imprecise records can be invaluable in furthering our knowledge. Similarly, historical records are very important if we are to determine the past distribution of each species and hence assess if its range is contracting or not.

All interested people, whether Service staff or not, are encouraged to use the system and to submit their records, including historical records, for inclusion in the system.

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A note on the predation of *Bufo marinus* juveniles by the ant *Iridomyrmex purpureus*

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The introduced cane toad *Bufo marinus* produces toxic compounds from dermal glands (Tyler 1987). These compounds restrict the number of potential predators of adult toads in Australia (Covacevich and Archer 1975; Hamley and Georges 1985) because predators either find the toads unpalatable or die following consumption. Similarly, eggs and tadpoles are toxic (Licht 1968; Wassersug 1971) and therefore may have a limited number of predators.

However, newly metamorphosed toads may lack the concentration of toxins of adults (Flier *et al.* 1980; Freeland and Kerin 1991) and Australian native animals have been observed eating, or have been fed, young cane toads with little or no adverse effects (Covacevich and Archer 1975). Newly metamorphosed toads are also small, active during daylight periods and commonly occur in dense aggregations around breeding sites (Freeland and Kerin 1991). This combination of characteristics suggests that newly metamorphosed toads may be the stage most vulnerable to predators (Zug and Zug 1975; Van Beurden 1980).

We report here on predation of newly metamorphosed toads (toadlets) by the common meat ant *Iridomyrmex purpureus* and the diurnal activity patterns of both species over one 24 h period.

Iridomyrmex purpureus was observed preying on toadlets at a natural pond 40 km north of Chinchilla in south Queensland on three occasions (February 3, March 8 and March 14–15, 1992). The oval shaped pond had a circumference of 270 m and was surrounded by sparse woodland and a grass understorey. There was little ground cover at the pond edge.

During daylight *I. purpureus* preyed upon toadlets around the margin of the pond. Capture of a single toadlet involved several ants with one ant making initial contact and inhibiting toad movement, followed by three to four more ants each grabbing a limb of the victim. The captured toadlet was spread out by an ant tugging at each leg and other ants would then sever the legs from the torso. All the parts were carried to the ant nest 30 m from the pond edge.